

REMARKS

This application has been carefully reviewed in light of the Office Action dated May 3, 2002. Claims 32 and 70 have been amended. A marked-up version of the amended claims, showing changes made, is attached hereto as Appendix A. Claims 1-40 and 64-86 are pending in this application. Reconsideration of the above-referenced application in light of the amendments and following remarks is requested.

Figures 1 and 2 have been amended as required by the Office Action in Applicant's "Request for Approval of Proposed Drawing Amendments" filed concurrently herewith.

Claims 32 and 70 have been amended to recite in pertinent part that "wherein said surface is a back surface of the chip," as recited by claim 32 and "wherein said second surface is a back surface of the die," as recited by claim 70.

Claims 1-2, 32, and 70 stand rejected under 35 U.S.C. §102(e) as being anticipated by Wang et al. (U.S. Patent No. 5,977,626) ("Wang"). Reconsideration is respectfully requested.

Claim 1 recites an integrated circuit structure comprising "at least one integrated circuit chip containing structures which may be affected by external magnetic fields . . . having a front surface and a back surface, said front surface being supported by a chip carrier, and a *magnetic field shielding material in contact with said back surface.*" (emphasis added). Similarly, claim 32 recites "[a]n integrated circuit chip containing structures . . . affected by external magnetic fields, said chip comprising a magnetic field shielding material in contact with a surface of said chip, wherein *said surface is a back surface of the chip.*" (emphasis added).

Claim 70 recites a method of packaging a semiconductor device comprising "electrically coupling a die carrier to a first surface of a die . . . being opposite to a second surface of said die, and contacting said second surface . . . with a first layer of magnetic field shielding material which shields said die from external magnetic fields, wherein said second surface is *a back surface of the die.*" (emphasis added).

Wang does not anticipate the claimed invention. Wang teaches a semiconductor package with a chip 22 adhered to the top surface of the substrate 20 by an adhesive epoxy 24 (Col. 3, lines 3-12). “A heat spreader of heat slug is arranged over the *top surface* . . . of the substrate 20 by using adhesive material 34.” (Col. 3, lines 49-51) (emphasis added).

The Office Action asserts that Wang teaches “a magnetic field shielding material 32 (heat spreader).” (Office Action, page 3). Applicant respectfully disagrees.

Wang discloses a structure that provides slightly improved EM shielding benefits; however, Wang’s heat spreader 32 is not a magnetic field shielding material nor is the invention directed at providing an EM shield. Wang’s “heat spreader is *formed* of a kind of metal or alloy *that has low thermal resistance*.” (Col. 3, lines 58-59) (emphasis added). Thus, “[t]he heat is directly spread by the heat spreader 32.” (Col. 4, lines 24-25). Accordingly, Wang’s heat spreader 32 is not formed of a magnetic field shielding material. Further, the heat spreader 32 is designed to spread heat, not to provide an EM shield as the Office Action asserts.

Wang merely discloses that “ground ring 20c *and* the heat spreader 32 construct a electric and. [sic] Magnetic (EM) shielding to suppress the EM effect,” as an incidental benefit (Col. 4, lines 20-22) (emphasis added). Wang does not teach, however, a “*magnetic field shielding material*,” to reduce the effect of external magnetic fields as claims 1, 2, 32, and 70 recite (emphasis added).

In addition, Wang’s structure provides the heat spreader 32 on the top surface of a chip 22 as illustrated by Figure 2. Thus, “[t]he heat spreader or heat slug 32 is arranged over the *top surface* . . . of the substrate 20 by using adhesive material 34.” (Col. 3, lines 49-51) (emphasis added). The heat spreader 32 merely “promotes *thermal* generated by the chip 22 *away from* the chip 22.” (Col. 3, lines 56-58). Figure 7C further illustrates that the heat spreader 32 is placed on top of the chip 22 and substrate 20 (Col. 4, lines 60-63). The heat spreader 32 is not in contact with a back surface of a chip. Claims 32 and 70 have been amended to emphasize that in the claimed invention: the back surface of the chip is in contact with the magnetic field shielding material.

Wang is directed at improving the dissipation of heat within a semiconductor package. Wang fails to teach a structure having a “magnetic field shielding material” as claims 1, 2, 32, and 70 recite, much less “*a first layer of . . . magnetic field shielding material*,” as dependent claim 2 and independent claim 70 recites (emphasis added). Wang also fails to teach “a magnetic field shielding material . . . [in contact with a] back surface” of the chip as the claims recite.

For at least these reasons, independent claim 1, and dependent claim 2 which incorporates all of the limitations of claim 1, and independent claims 32 and 70, are allowable.

Claims 1-2, 9-12, 19-22, 32, 39-40, 64-65, 70-74, and 76-78 stand rejected under 35 U.S.C. §103(a) as being unpatentable over prior art (Figs. 1 and 2 of Applicant’s Specification) in view of Wang et al. (U.S. Patent No. 5,977,626) (“Wang”) or Cassarly et al. (U.S. Patent No. 4,433,886) (“Cassarly”) and further in view of Higuchi et al. (U.S. Patent No. 4,835,598) (“Higuchi”). Reconsideration is respectfully requested.

At the outset, Applicant notes that the arguments provided above regarding independent claims 1, 32, and 70 are equally applicable here. Dependent claims 2, 9-12, and 19-22, incorporate all of the limitations of claim 1. Dependent claims 39-40 incorporate all of the limitations of claim 32. Dependent claims 71-74 and 76-78 incorporate all of the limitations in claim 70. Accordingly, dependent claim 2, 9-12, 19-22, 39-40, 71-74, and 76-78, are similarly allowable for the reasons set forth above regarding independent claims 1, 32, and 70.

Independent claim 64 further recites an integrated circuit structure comprising “a die . . . connected to a die carrier, said die in contact with a first layer of magnetic field shielding material . . . and a printed circuit board . . . connected to said die carrier, said printed circuit board being in contact with a second layer of magnetic field shielding material.”

Figures 1 and 2 of Applicant’s specification illustrate problems associated with a conventionally packaged flip-chip device. Specifically, the die or chip is not in contact with

magnetic field shielding material. Further, Figures 1 and 2 show that conventional semiconductor devices were not packaged with magnetic field shielding material.

Cassarly teaches “a new and improved *connector mounting* for integrated circuit chip packages . . . and provides a *connector mounting* which is of appealing low-profile form . . . and adapted for quick and easy assembly . . . removal and replacement of the chip package.” (Col. 1, lines 33-41) (emphasis added).

As discussed above, in response to the 35 U.S.C. §102(c) rejection, Wang does not anticipate, much less render Applicant’s invention obvious. Wang does not disclose nor even suggest magnetic field shielding material that prevents an integrated circuit from being affected by external magnetic fields, or a magnetic field shielding material in contact with a back side of a chip. Wang does not address the problems of the present invention. Wang addresses problems associated with the inefficiency of spreading heat within a device. Thus, there is no motivation to combine Wang and Applicant’s Figures 1 and 2.

Applicant respectfully disagrees with the Office Action’s reliance on Cassarly. Cassarly states that “[t]he principal object of the invention is to provide a *connector mounting* for any sized integrated circuit chip . . . which permits quick and easy assembly of the chip package with or removal from the connector mounting.” (Col. 2, lines 18-24). Cassarly addresses a different problem associated with integrated circuit chip packages: connector mounting. Further, Cassarly teaches, “[t]he chip package B forms *no part of the present invention*.” (Fig. 1 and Col. 3, lines 22-24) (emphasis added). Accordingly, no motivation to combine Cassarly with Applicant’s Figures 1 and 2 exists.

Assuming arguendo, Cassarly and Wang can be used in combination with Figures 1 and 2 of Applicant’s specification, Higuchi adds nothing to rectify the deficiencies associated with the cited references.

Higuchi discloses printed wiring board 1 with an insulating substrate 2 with openings 3, wherein a thermo-conductive plate 4 is provided within the opening 3. An insulating adhesive layer 5 is provided over the substrate 2 and thermo-conductive plate 4. Finally, metal laminated foil 6 is provided on the insulating layers 5 (Col. 2, lines 15-49).

At the outset, Applicant notes that it is illogical to combine Higuchi with Cassarly, since Cassarly addresses a different problem than the Higuchi structure as discussed above. The integrated chip package forms no part of the invention in Cassarly and specifically, Cassarly solves the problem associated with connector mountings. Whereas, Higuchi addresses the problems associated with wiring boards, the heat-releasing capabilities and electric insulation properties. Thus, combining the cited references with Figures 1 and 2 does not render Applicant's invention obvious.

The Office Action asserts that Higuchi is combinable with Wang or Cassarly since either cited reference suggests "that a *metal layer in contact* with a die/semiconductor chip could *protect* the die/chip from *external electromagnetic radiation*." (Office Action, page 5) (emphasis added). Applicant respectfully disagrees. Wang and Cassarly are completely void of this teaching or suggestion.

The Office Action further asserts that Higuchi provides "one or two layers of metal foil interlaminated with adhesive and insulating layers *could also shield* the die/chip from *stray electromagnetic radiation*." (Office Action, page 5) (emphasis added). Applicant respectfully disagrees.

Higuchi's laminated metal foil 6 is used to form an electric circuit 8. "[A]n electric circuit pattern 8 is formed by . . . *etching* the metal foil laminate 6. Then a selected portion of the electric circuit pattern 8 *formed in the metal foil* laminate 6 . . . is cut." (Col. 3, lines 42-47) (emphasis added). Higuchi does not disclose or suggest that the metal foil layers shield the chip from external magnetic fields. The metal layers themselves, form the electric circuit pattern and are not a magnetic field shielding material.

Higuchi's device may experience better magnetic shielding properties; but, this is not a direct result of applying a magnetic shielding material. Higuchi teaches "[s]ince the thermo-conductive plate 4 is surrounded by the insulating substrate 2, the edge of the thermo-conductive plate 4 is not exposed at the end of the substrate 2 unlike the metal core board of the prior art." (Col. 3, lines 17-21). Accordingly, the thermo-conductive plate is insulated by the insulating substrate 2 and insulating adhesive layers 5. This

configuration provides “high electric insulation as well as the property of the metal plate of heat escaping and magnetic shielding.” (Col. 4, lines 5-8). The purpose of the insulating layers is to electrically insulate the metal plate, not to provide magnetic shielding properties (Col. 3, lines 21-23).

The cited combination of references does not render Applicant’s invention obvious. The references do not suggest an integrated circuit structure comprising “a die . . . connected to a die carrier, *said die* in contact with *a first layer* of magnetic field shielding material . . . and a printed circuit board . . . connected to said die carrier, *said printed circuit board* being in contact with a *second layer* of magnetic field shielding material,” as recited by independent claim 64 (emphasis added), much less a “*third layer* of magnetic field shielding material,” as dependent claim 65 recites (emphasis added).

Claims 1-2, 9-12, 19-22, 32, 39-40, 70-74, and 76-78, are allowable for the reasons discussed previously. Accordingly, withdrawal of the rejections of claims 1-2, 9-12, 19-22, 32, 39-40, 64-65, 70-74, and 76-78 is respectfully solicited.

Claims 3-8, 13-18, 23-31, 33-38, 66-69, 75, 79-80, and 82-86 stand rejected under 35 U.S.C. §103(a) as being unpatentable over prior art (Figs. 1 and 2 of Applicant’s Specification) in view of Wang et al. (U.S. Patent No. 5,977,626) (“Wang”) or Cassarly et al. (U.S. Patent No. 4,433,886) (“Cassarly”) and further in view of Higuchi et al. (U.S. Patent No. 4,835,598) (“Higuchi”) and further in view of Kubo (U.S. Patent No. 5,307,100). Reconsideration is respectfully requested.

At the outset, Applicant notes that the arguments provided above regarding independent claims 1, 32, 64, and 70 are equally applicable here. Dependent claims 3-8, 13-18, and 23-31 incorporate all of the limitations of claim 1. Dependent claims 33-38 incorporate all of the limitations of claim 32. Dependent claims 66-69 incorporate all of the limitations in claim 64. Dependent claims 75, 79-80, and 82-86 incorporate all of the limitations in claim 70. Accordingly, dependent claims 3-8, 13-18, 23-31, 33-38, 66-69, 75, 79-80, and 82-86 are similarly allowable for the reasons set forth above regarding independent claims 1, 32, 64, and 70.

As discussed previously, the asserted combination of Applicant's Figures 1 and 2 in view of Wang or Cassarly, and in further view of Higuchi, does not render the claimed invention obvious.

The Office Action further relies on Kubo as disclosing an "electromagnetic shield plate 55 made of copper, aluminum, ferrite, or the like . . . thereby teaching that copper and aluminum server [sic] as magnetic shielding materials just as ferrite." (Office Action, page 6). Applicant respectfully submits that the Office Action's reliance on Kubo is misplaced.

Kubo provides "a magnetic recording/reproducing apparatus for *a camera* which is capable of obtaining good head contact with a *photographic film* irrespective of a change in mechanical stress of the *photographic film* or a change in rigidity caused by a change in environmental conditions." (Col. 1, lines 61-68) (emphasis added).

There is no teaching or suggestion in Kubo that the invention is applicable to semiconductor devices, much less a chip carrier or printed circuit board of a semiconductor device, as claimed. Further, there is no teaching or suggestion in Higuchi that the methods or structures in a camera device are applicable to a semiconductor device. Accordingly, Kubo is not properly combinable with Higuchi.

The Office Action further contends that "[w]ith respect to claims 15-18, 23, 25-31, 35-38, 68-69, 75, 81-82, and 85-86 . . . it would have been obvious . . . to select known available materials and technologically feasible sizes, shapes, and designs as recited in these claims." Applicant respectfully disagrees and the Office Action provides no further support for the assertion.

Dependent claim 23 recites that a "third magnetic field shielding material is embedded within said printed circuit board," while dependent claim 27 recites "a fourth magnetic field shielding layer," and dependent claim 75 recites that "said second layer of magnetic field shielding material is embedded within said printed circuit board." The prior art fails to disclose or suggest structures with a magnetic field shielding material as independent claims 1, 32, 64, and 70 recite, much less a second, third, or even fourth layer

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of magnetic field shielding material.

In view of the above, each of the presently pending claims in this application is believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to withdraw the outstanding rejection of the claims and to pass this application to issue.

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Respectfully submitted,

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APPENDIX A

32. (amended) An integrated circuit chip containing structures which may be affected by external magnetic fields, said chip comprising a magnetic field shielding material in contact with a surface of said chip, wherein said surface is a back surface of the chip.

70. (amended) A method of packaging a semiconductor device comprising:

electrically coupling a die carrier to a first surface of a die, said first surface being opposite to a second surface of said die; and

contacting said second surface of said die with a first layer of magnetic field shielding material which shields said die from external magnetic fields, wherein said second surface is a back surface of the die.